

## MOVEABLE CONTROL PEDAL ASSEMBLY

### **FIELD OF THE INVENTION**

The present invention relates to a control pedal assembly for motor vehicles and the like. More specifically, the present invention relates to control pedals for motor vehicles which pedals can be moved by the operator of the vehicle to accommodate different sized operators and/or different operating conditions.

### **BACKGROUND OF THE INVENTION**

The ergonomics and safety of motor vehicles have undergone many improvements. One of these improvements has been the increased range of adjustments that can be made to the positioning of the vehicle operator and the positioning of the operating controls of the vehicle with respect to the operator. Specifically, in addition to providing a variety of positioning adjustments to the operator's seat, many vehicles now provide adjustments to the steering wheel height and distance and the forward and backward positioning of the control pedals (brake, accelerator and/or clutch) with respect to the operator's position.

An example of an adjustable pedal is shown in U.S. Patent 6,431,021 which shows a pedal which can be moved about a pivot point to adjust the pedal position forward and backward as desired. Published PCT application WO 01/76924 shows another adjustable pedal which moves about pivot points to allow forward and backward adjustment.

While prior art adjustable pedals have been well received in the marketplace, they do suffer from some problems. For example, some adjustable pedals are quite complex and expensive to manufacture. Further, movement of the pedals in many of the prior art adjustable pedal mechanisms is achieved by pivoting a sub-assembly of the pedal mechanism through a circular path about a pivot point. This pivoting motion changes the geometry between the pedal, its mounting bracket and the rod or cable being acted on by the pedal. Thus, adjustment of the pedals along the circular path about the pivot also alters the mechanical advantage provided by the pedal assembly and this results in the controls of the vehicle operating somewhat differently when the pedals are adjusted to different positions. Other prior art adjustable pedals

also suffer from changing mechanical advantage between the pedal and the control cable or rod as the position of the pedal is adjusted. Such a variation in the operation of the vehicle controls is clearly undesirable.

It is therefore desired to have a moveable control pedal assembly which is not overly complex and/or expensive to manufacture and which does not alter the operation of the vehicle controls when moved into different positions.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel moveable control pedal assembly which obviates or mitigates at least one disadvantage of the prior art.

According to a first aspect of the present invention, there is provided a control pedal assembly moveable toward and away from a vehicle operator, comprising: a mounting bracket; at least one pedal arm; a pedal carriage to which the pedal arm is pivotally attached; an extender mechanism connected to the mounting bracket and including: at least one extender rod having a threaded portion and a portion engaged to a first driven gear, the threaded portion of the extender rod engaging a complementary threaded bore in a bushing attached to the pedal carriage, the extender rod being substantially prevented from lateral movement; a control rod having a threaded portion and a portion to engage a second driven gear, the threaded portion of the control rod engaging a complementary threaded bore in a bushing attached to the pedal arm, the portion engaging the second driven gear being laterally movable through the second driven gear; and a driving gear engaging the first and second driven gears such that, when the driving gear is rotated in a first direction by a driving means, the pedal carriage is moved toward the mounting bracket and when the driving gear is rotated in a second direction by a driving means, the pedal carriage is moved away from the mounting bracket.

Preferably, at least two extender rods are provided between the extender mechanism and the pedal carriage. In another embodiment, at least two pedal arms are pivotally mounted to the pedal carriage, each pedal arm has a threaded bushing and a separate control rod engages each respective pedal arm and each control rod has its own driven gear.

## BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the attached Figures, wherein:

Figure 1 shows a perspective view of a control pedal assembly in accordance with the present invention;

Figure 2 shows a partially cut away side view of the control pedal assembly of Figure 1;

Figure 3 shows side view of a pedal carriage and pedal arm of the control pedal assembly of Figure 1;

Figure 4 shows another partially cut away side view of the control pedal assembly of Figure 1; and

Figure 5 shows an extender mechanism and extender rods and a control rod of the control pedal assembly of Figure 1.

## DETAILED DESCRIPTION OF THE INVENTION

A control pedal assembly in accordance with an embodiment of the present invention is indicated generally at 20 in Figures 1 through 5, wherein like components are indicated with like reference numerals.

Assembly 20 includes a bracket 24 by which assembly 20 is mounted to a vehicle body (not shown) and bracket 24 includes a pair of spaced arms 28a, 28b which extend forwardly from bracket 24. Arms 28a, 28b each include a slot 32 in which a pedal carriage 36 is carried. As best seen in Figure 3, pedal carriage 36 comprises carriage sides 40a, 40b to which sliders 44 are mounted. Sliders 44 engage slots 32 in arms 28a, 28b and allow pedal carriage 36 to move forward and backward along slots 32.

A pedal arm 48 is pivotally mounted to pedal carriage 36 by a pin 52 which extends between carriage sides 40a, 40b and a coil return spring 56, about pin 52, acts between pedal arm 48 and pedal carriage 36 to bias pedal arm 48 to an un-engaged position.

Each side 40a, 40b of pedal carriage 36 includes a bushing 64 with a threaded bore and another bushing 64 with a threaded bore is provided on arm 48. The threads of each bushing 64 have the same pitch as the threads of each other bushing 64.

Bushing 64 on pedal arm 48 is rotatably mounted to pedal arm 48 allowing the threaded bore to remain generally in the same horizontal orientation through the range of movement of pedal arm 48 about pin 52.

As best seen in Figures 4 and 5, an extender mechanism 68 is mounted to bracket 24 and includes a driver gear 72 and three driven gears 76a, 76b and 76c. Each driven gear 76 has a square center passage which engages a complementary square cross-sectioned portion of a respective extender rod 80a and 80b and a control rod 84. Each extender rod 80, and control rod 84, includes a threaded portion which engages the complementary threaded bore in a respective bushing 64 and extender rods 80a and 80b are rotatably mounted to bracket 24 such that lateral movement of extender rods 80a and 80b is prevented while rotation is permitted.

Unlike extender rods 80a and 80b, control rod 84 has a longer square cross-sectioned portion 88 which can slide through the square-shaped center passage in driven gear 76, permitting lateral movement of control rod 84 toward or away from bracket 24 as pedal arm 48 is pressed and released. Further, control rod 84 includes an actuator end 92 which engages the hydraulic cylinder, cable or other control mechanism which pedal arm 48 is intended to operate.

As will be apparent, when driver gear 72 is rotated, by, for example, a DC motor (not shown) via a cable drive or any other suitable driving means (also not shown), each driven gear 76 turns. As driven gears 76 rotate, they each rotate a respective extender rod 80 and control rod 84 in turn. As extender rods 80 rotate, each bushing 64 on carriage sides 40a, 40b move along extender rods 80, either moving toward bracket 24 or away from it, depending upon the direction of rotation of driver gear 72. Similarly, as control rod 84 rotates, bushing 64 on pedal arm 48 moves along control rod 84, either moving toward bracket 24 or away from it, depending upon the direction of rotation of driver gear 72.

As can now be readily seen, when a suitable driving means is activated by a vehicle operator, rotating driver gear 72, extender rods 80a and 80b and control rod 84 are rotated and bushings 64 move along them. As bushings 64 are moved along extender rods 80, pedal carriage 36 moves either toward or away from bracket 24. Pedal arm 48 also moves with pedal carriage 36, toward or away from bracket 24, without altering the lateral positioning of actuator end 92 of control rod 84 and

without altering the geometry of pedal arm 48 with respect to pin 52. Thus, the mechanical advantage on control rod 84 provided by pedal arm 48 does not change as pedal carriage 36 is moved along extender rods 80a and 80b.

While it is presently preferred that a pair of extender rods 80 be provided between extender mechanism 68 and pedal carriage 36, it is contemplated that in some embodiments, assembly 20 can include only a single extender rod 80 between pedal carriage 36 and extender mechanism 68. It is also contemplated that in other embodiments more than two extender rods 80 can be provided between pedal carriage 36 and extender mechanism 68.

While not shown, it will also be apparent to those of skill in the art that two or more pedals, such as an accelerator and a brake pedal, can be mounted to a single pedal carriage 36 which is moved by one, two or more extender rods 80 as desired. In such a case, each pedal will have its own control rod 84, driven gear 76 and bushing 64 to allow the pedals to be moved towards or away from bracket 24 as a group with pedal carriage 36, while not altering the mechanical advantage provided by the pedals and not laterally moving the actuator end 92 of each respective control rod 84.

Conversely, if it is desired to provide adjustment of each pedal independently of each other pedal, then each pedal can be provided with its own pedal carriage 36, extending mechanism 68, etc.

The above-described embodiments of the invention are intended to be examples of the present invention and alterations and modifications may be effected thereto, by those of skill in the art, without departing from the scope of the invention which is defined solely by the claims appended hereto.